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Monitoring a lorry environment during a long delivery journey of day-old chicks. I

by J. Tamlyn

Agricultural Memorandum No. 1079

Summary:

Day-old broiler chicks are quite resilient to being transported although heat stress, even for short periods (< 1 hour), can depress live-weight gain (while not affecting subsequent mortality rates).

Logging of temperature and relative humidity in a chick-transporter lorry over periods of over two hours, from loading at the hatchery to discharge at a finishing farm, showed that the temperature fluctuations were within acceptable limits. Humidity levels were low but just above the critical level. 'Environmental control' was achieved by ventilation crudely controlled by the driver from temperature readings on dials near the cab.

Introduction:

Agricultural Memorandum 1074 described a study, in co-operation with a North Wales hatchery*, of the environment of a chick-transporter lorry. It was suggested that the studies be repeated at another hatchery where longer trips (over an hour) are made to the finishing farm under very warm or very cold conditions. This Memorandum reports an environmental study of a journey of over two hours, but not during a particularly warm or cold period, on the 21st August 1986.

Method:

The method described in Ag Mem No 1074 was followed fairly closely. The different stacking arrangement meant that the location of the sensors could not be copied exactly. Two data loggers were used to record the temperature in six different locations in the chick container, (see fig 1). Two humidity sensors (B & D) were used to monitor the humidity: B among the baskets of chicks and D at the back of the container, not surrounded by baskets of chicks. The temperature sensors A and C were located with the humidity sensors: A with B and C with D. Sensors E and F were located with the cab sensors on the sides of the container. Sensor G was situated close to the circulation fans and H at the back of the container between the last stack of baskets and the tail-gate. The stacking arrangement was slightly different from previous studies in that four stacks of baskets were accommodated across the container. Each basket contained 150 chicks, with up to 10 baskets per stack in six rows, making a possible total of 4 x 150 x 10 x 6 = 36 000 chicks. There were actually 34 000 chicks transported on this occasion.

The equipment was set up and tested the day before. The loading of chicks was not expected to begin before 0930 hrs which gave ample time for the loggers to be switched on the next morning. The logger is capable of storing 2000 readings per channel. At a time interval of 12 seconds between each record, (2000 X 12 = 24 000 seconds = 400 mins = 6 hrs 40 mins) there was enough time to monitor the entire journey from loading chicks to returning to the hatchery. This time resolution provided an excellent record

of the effects of the activities. The author also travelled in the cab to keep a record of the time of various activities such as periods of slow-moving through towns, traffic jams, and when the driver operated the vent. The times of loading, arrival at the farm and unloading were also noted. After the trip the loggers were interrogated and the data analysed.

Results: (see figs 2 & 3)

09:32 - 09:54 (All times in BST)

Both loggers began recording at 09:32 BST. The temperature was a constant 12 C and relative humidity 85 per cent. The variation in temperature from one location in the container to another was 0.2 C. During the eight minutes taken to load the chicks, the temperature rose to 26 C among the chicks but only 22 C away from the chicks.

09:55 - 11:04

The sensors E & F (which are with the cab's monitoring sensors) recorded a temperature of 23 C then there was a sharp drop (as lorry began journey) of about 5 C to 18 C. The variation in temperature throughout the container (ie. between the basket environment and the surrounding environment) at 10:00 being some 9 C. (27 C at A compared with 18 c at F & H) The temperature gradually rose during this period to about 26 C. Among the chicks the temperature also rose gradually, reaching 32 C at about 11:00. reducing the variation to 6 C. The relative humidity was 50 to 60 per cent among the chicks and 70 to 80 per cent elsewhere.

11:04 - 11:23

The lorry slowed down to a crawling pace as it made its way through a small town. The vent was opened and **the temperature (E&F) began to fall. The temp among the chicks however, continued to rise by about 2 C during this time.** The relative humidity fell from 75 to 55 per cent. Around the chicks the relative humidity fell to 40 per cent from 50 percent.

1123 - 1127

The lorry began to move faster and after a few minutes the vent was closed. There was a marked fall in temperature in this period of up to 5 C. relative humidity rose by about 5 percent. The temperature variation away from the chicks at this location was only in the region of 0.5 C, but the difference in temperature between the monitoring sensors E&F indicated to the driver, compared with around the chicks was nearly 15 C. (17 - 18 C at E&F compared with 31- 32 C at A). The relative humidity among the chicks was below 45 percent but at the back of the container (C&D) where the temperature was lower the humidity was above 52 percent.

11:27 -11:30

The temperature rose throughout the container when the vent was closed reaching between 22 and 26 C. the temperature among the chicks only rose by about 1 C to 33 C. This reduced the difference in temperature between the air around the chick baskets and the air in rest of container to 10 C.

11:30 - 12:00

The temperature stopped rising and settled at an average of 25 C at E&F and 32 C among the chicks. The temperature fluctuated by about 2 to 3 C when the lorry was held up at traffic lights at 11:44. Relative humidity was also between 40 and 50 percent among the chicks and between 60 and 70 percent at location D.

12:00 - 12:12

The vent was opened a second time as slow moving traffic was experienced again. This time the fall in temperature was only 5 C at the most. Around the chicks the temperature rose by 3 C in this time

12:12 - 12:21

The temperature dropped during this period as the vent was not closed, the greatest drop in temperature being 5 C. At the lowest point the temperature was 18 to 22 C but the temperature around the chicks did not fall below 31 C. The relative humidity around the chicks reached its lowest point for the journey, 34.5 percent, after 2 hours 20 minutes of transport.

12:21 onwards

There was a rise in temperature of about 5 C as the lorry was waiting and manoeuvering to the appropriate shed at the farm. Then at 12:30 the temperature fell quickly (10 C in twenty minutes) as the chicks were unloaded. There was a corresponding rise in relative humidity as the temperature fell. After all the chicks had been unloaded the temperature dropped to 14 C - just above the ambient external temperature.

Conclusions:

The temperatures experienced throughout the journey were within the accepted critical limits for chick well-being. The outside temperature was 11 - 13 C. The humidity fell below the lower limit of 45 per cent on two occasions: 1122 to 1128 and 1210 to 1223, the lowest value being 34%. The relative humidity was between 40 and 60 per cent for most of the journey. As suggested in AgMem 1074, a humidifier may be needed to ensure the humidiity is kept above the lower limit. It would be interesting to see what the relative humidity would be on a dry day as this study took place on a rainy day when the external relative humidity would have been higher than on a dry day.

The variation of temperature among the chicks was less than in the environment around the chicks. The driver monitored the temperature by using two dials mounted on the container, to the rear of the cab . The temperature indicated on this dial does not always reflect the temperature changes among the chicks. At one point (11:15) the temperature which would be indicated to the driver was falling while the temperature around the chicks was actually rising!.

The study must be repeated on a very warm or a very cold, dry day to assess the effects of such conditions on the internal environment of the transporter lorry.

Acknowledgements:

The studies were carried out with the co-operation of the Hatchery Manager* and the advice of Mr R King, Regional Poultry Adviser, and Dr. J R Starr Agrometeorology Dept.

* : Anonymity of the enterprise has been preserved for commercial reasons.

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Any comments or suggestions on this paper should be sent to the author.

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Fig 1 Diagram showing locations of temperature and humidity probes used during transport of day old chicks on 21 / 8 / 86

Humidity probes = B & D

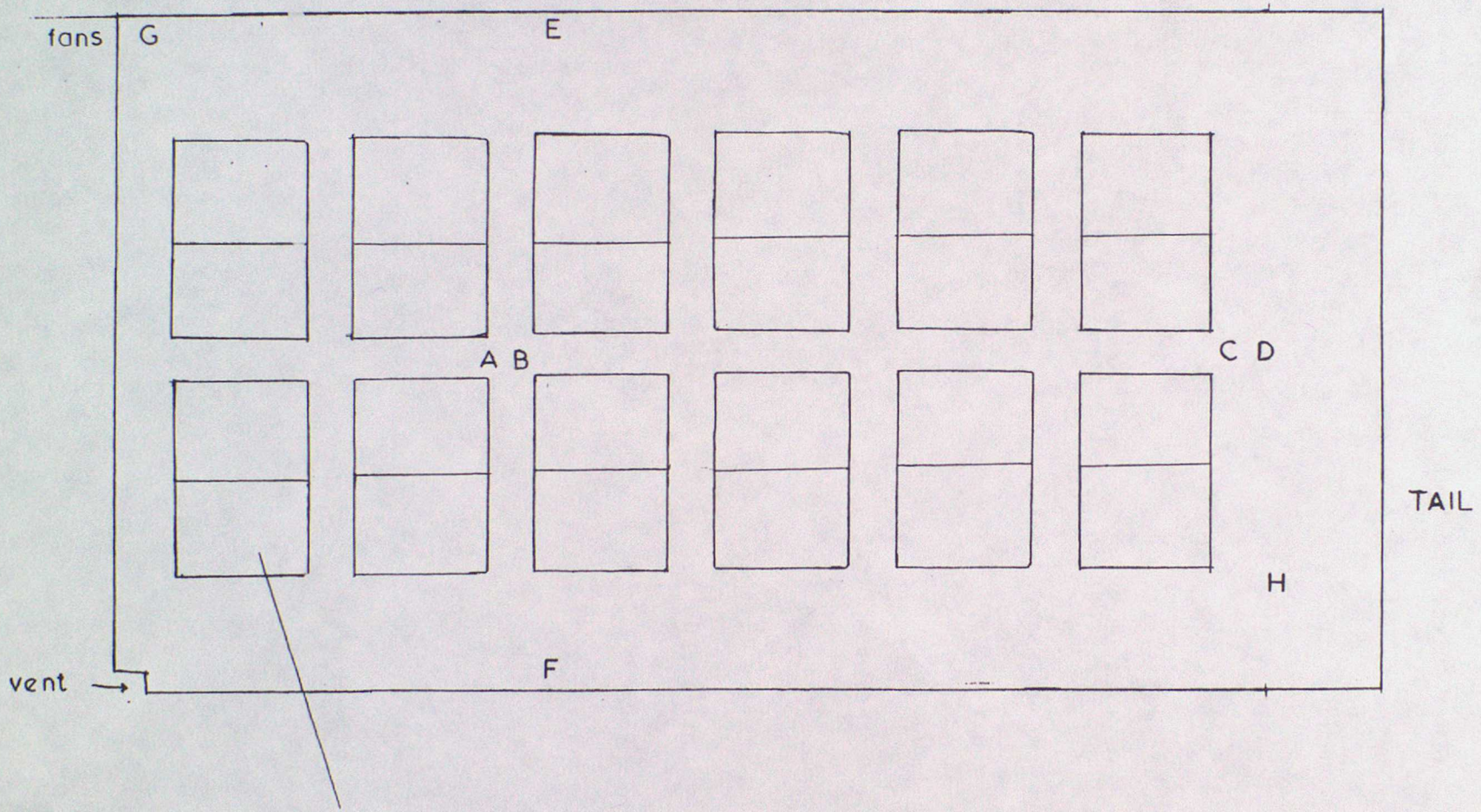

Fig 1

TABLE 1

ACTIVITIES RECORDED DURING THE JOURNEY TO THE FINISHING FARM

TIME (BST)	ACTIVITY
09:32	start
09:38	lorry started
09:40	lorry backing into loading bay
09:42	first 'stack' containing chicks placed in container
09:50	approximately half loaded
09:54	loading complete
09:55	ready to depart
10:14	traffic queue in small town, slow speed
10:17	normal speed
10:38	enter another small town, stop and go
10:50	end of stop / go traffic
11:07	town traffic
11:08	vent opened
11:23	end of town traffic - moving faster.
11:27	vent closed
11:44	traffic lights
11:47	traffic lights
12:00	congested traffic Vent opened
12:12	normal speed again
12:21	arrive at farm
12:22	reversing to shed
12:23	waiting for shed doors to be opened
12:25	back of lorry opened
12:28	fisrt chicks unloaded
12:40	last chicks unloaded

A
B
C
D
°C
%
35
30
20
10
0
100
80
40
0032
932
938 STARTING
940 BACKING INTO BAY
942
950 V2 BASKETS LOADED
954 LOADING COMPLETE
955 DEPART
1014 TL
1038
STOP-START
1050
1100
1104
1107 VENT OPENED
STOP-START
1123
1127 VENT CLOSED
1144 TL
1146 TL
1200 VENT OPENED
SLOW
1212
1221 ARRIVE AT FARM
1225 BACK OPENED
1227 1st CHICKS OFF
1240 UNLOADING COMPLETED
1000
1030
1100
1130
1200
1230
264
346
71
345
18
52
845

Fig 2

Fig 2

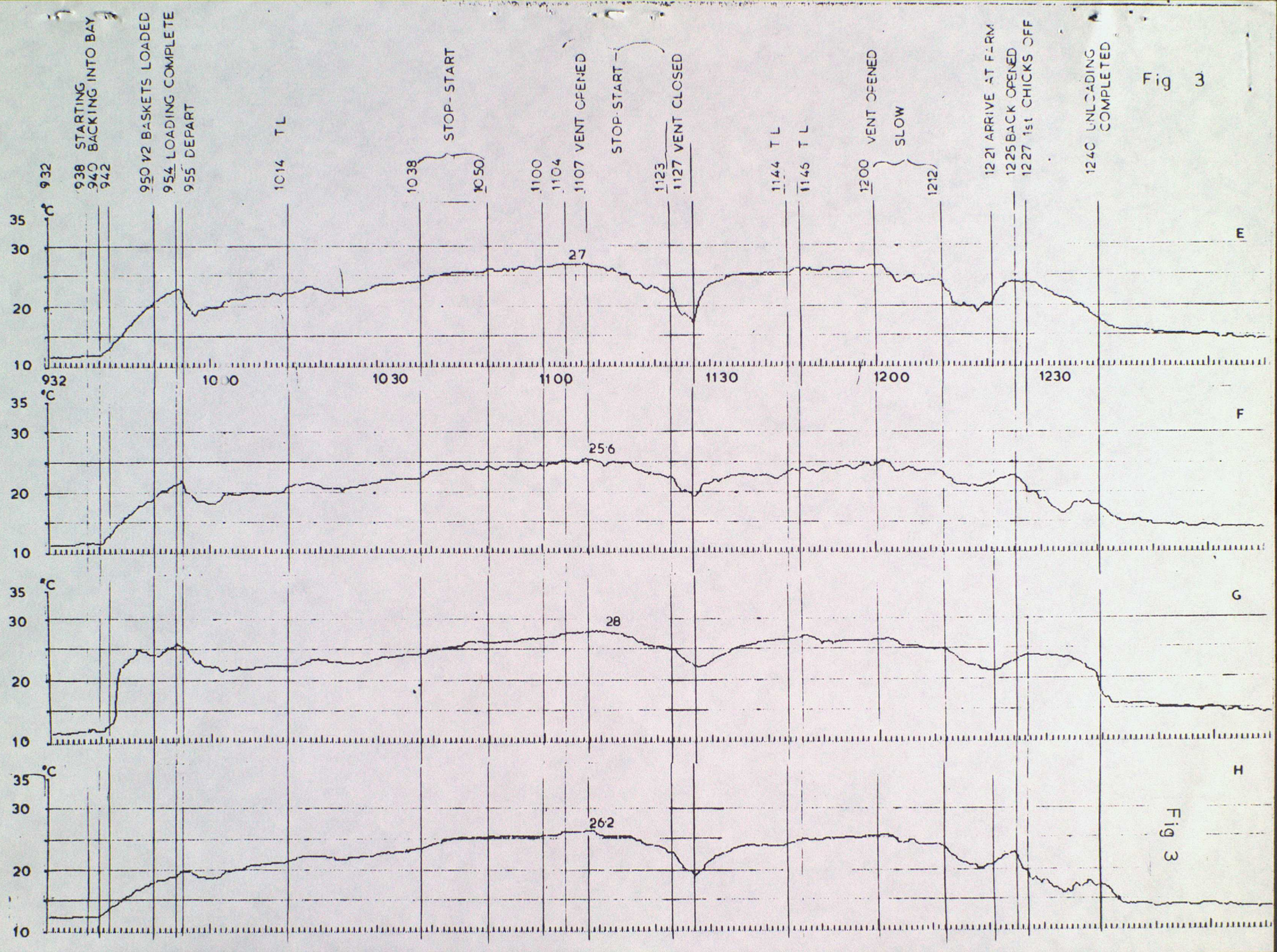
932
938 STARTING
940 BACKING INTO BAY
942
950 1/2 BASKETS LOADED
954 LOADING COMPLETE
955 DEPART
1014 T L
1038 STOP-START
1050
1100
1104
1107 VENT OPENED
STOP-START
1123
1127 VENT CLOSED
1144 T L
1145 T L
1200 VENT OPENED
SLOW
1212
1221 ARRIVE AT FARM
1225 BACK OPENED
1227 1st CHICKS OFF
1240 UNLOADING COMPLETED
°C
35
30
20
10
E
27
932
1000
1030
1100
1130
1200
1230
F
25·6
G
28
H
26·2

Fig 3

Fig 3